

Volunteered Geographic Information

Volunteered Geographic Information (VGI) is provided by a large number of individuals and is typically unstructured and uncertain, making parametric statistical modeling difficult. Additionally, high volume data streams complicate further the processing of the data. GIScience requires adapted models to keep up with the increasing availability of high-volume data streams. GIS will evolve from a data acquisition and management tool towards a system with a big focus on knowledge extraction and decision support for complex socio-economic systems.

Flexible software environment

i2maps is a flexible software environment for geocomputation. It provides libraries that make it easier to write software for collecting, processing, modelling, visualising, and disseminating spatio-temporal data. Its logic allows for flexible data crawling and streaming, data analysis and powerful spatio-temporal visualisation tools. i2maps is written as a client-server system, with Python-based components on the server-side, and HTML/JavaScript on the client-side. Its structure allows for easy integration with new algorithms, processing of streaming data, and distributed computing for high-volume data analysis and knowledge extraction. i2maps is built as a flexible system with a wide range of potential applications. It will be distributed under an open-source licence, along with usage examples and documentation.

i2maps _ The GeoComputation Platform

Data streams & feature selection

Modern interconnected IT infrastructure and sensors generate huge data streams, e.g. communication logs (e-mail, phone calls), or web streams of short messages from services like Twitter. Together with APIs for querying a wide variety of WebServices, this opens new possibilities for data analysis. However, the nature of the data requires robust software and powerful analysis techniques for extracting interesting features.

Statistical machine learning

Big low-level data sets need powerful modelling and processing tools such as those of machine learning. Machine learning shifts focus from data models to the properties of robust non-parametric non-linear algorithms able to learn and predict from data.

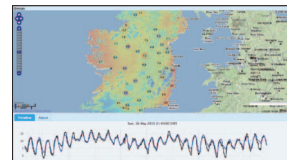
Cloud computing

The big amount of data available needs distribution of the computation tasks. Recent advances in computational approaches, such as Map-Reduce, and cloud computing using platforms like Hadoop and dedicated services such as Amazon cloud computing open new ways for analysing data in GIScience and especially in VGI. The open structure of i2maps allows integrating such new approaches.

Example applications

Interactive visualisation

i2maps allows browser-based interactive visualisation of spatio-temporal data. Different data sources such as PostGIS, Shapefiles, WMS, WFS or continuous input from environmental sensor networks can be used. Additionally, scale-dependent rendering of big complex vector layers gives interesting visualisation possibilities, e.g. for interactive cartograms.



Spatial prediction of air temperature in Ireland
Integration of a weather data crawler with a General Regression Neural Network for temperature mapping in space and time.



Visualisation of the popularity of Twitter
Integration of a data crawler with thematic mapping as a choropleth map or a cartogram, along with the evolution in time.



Human activity mapping
Detection of human activity using a video-based stream and dynamic mapping.



Agent-based simulation
Browser-based visualisation of agent-based simulation. Integration of the output of the multi-agent simulation with the visualisation of a potentially big number of moving objects.

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